degrees with n being an integer (i.e. a positive whole number taken from the sequence 1, 2, 3, …) which is equal to the number of modulators associated with each photodetector. As an example, when n=3, the phrase "an integer fraction of a period of the ac reference signal" would refer to a phase delay that is equal to 0 degrees, or 360·1/3 = 120 degrees, or 360·2/3 = 240 degrees. This example can be seen in Claim 15, from page 10, lines 17-27, and from Fig. 1. As another example, if four modulators are used for each photodetector (i.e. n = 4) then the "integer fraction of a period of the ac reference signal" would refer to phase delays of 0 degrees, 360·1/4 = 90 degrees, 360·2/4 = 180 degrees, and 360·3/4 = 270 degrees. This example is disclosed on page 10, lines 19-23, on page 17, lines 14-22, and in Fig. 4. Thus, from the examples provided in Applicants' specification, the number n of modulators associated with each photodetector will define the phase delay for each modulator as described above so that the phrase "an integer fraction of a period of the ac reference signal" is not indefinite or unclear.

Furthermore, the number n of modulators associated with each photodetector will generally be small (e.g. 3 or 4) so that there will be only a small number of values for the phase delay in Claims 12 and 22. This small number of values for the phase delay will be used for the n modulators in the signal processing circuitry 20 associated with each photodetector. Applicants therefore respectfully submit that the phrase "an integer fraction of a period of the ac reference signal" is not indefinite or unclear. Therefore, Applicants respectfully request reconsideration of the 112 rejection of Claims 12 and 22.

The Office has also inquired about whether the phrase "an integer fraction of a period of the ac reference signal" means that the system automatically carries out what appears to be a mathematical operation without knowing their values or range of values. Applicants respectfully submit that this is not the case since the phase delay of each modulator is preset to be one of the values described above which will be determined by the exact number of modulators used. With three modulators, the phase delays will be fixed at 0°, 120°, and 240°; and with four modulators, the phase delays will be fixed at 0°, 90°, 180° and 270°. Thus, the system will know the values of the phase delay for each modulator prior to carrying out any mathematical operations needed to analyze the data. This can also be seen from Fig. 1 which shows the phase delays φ_1, φ_2, φ_3 as already being present on the signals 30 [labelled as $f(\omega t + \varphi_1)$, $f(\omega t + \varphi_2)$ and $f(\omega t + \varphi_3)$] from the reference modulation source 28 in order to modulate the photodetector output prior to the modulator output being integrated and input into the computational unit 38 (see also page 9, line 27 through page 10, line 27). The computational unit 38 then fits the data to a Fourier decomposition equation using these known values of the phase delays φ_1, φ_2, φ_3 and calculates a phase shift φ for the light received from each photodetector (see page 11. lines 2-13). This calculated phase **shift** φ is different from the known values of the phase **delay** recited in Claims 12 and 22.

2. 102 Rejection:

The Office has rejected Claims 1-6, 8, 11, 14, and 16-21 under 35 U.S.C. 102(e) as being anticipated by Bamji et al (6,580,496).

With regard to Claim 1, the following essential claim limitations are not disclosed by Bamji: (1) "a **plurality** of modulators associated with **each** photodetector" with a "different phase delay for each modulator" and (2) "a **plurality** of integrators associated with **each** photodetector." These essential claim limitations require that **each** photodetector have **multiple** modulators operating with different phase delays, and that **each** photodetector have **multiple** integrators. This can be seen from Applicants' Fig. 1 where everything included in the dashed box for signal processing circuitry 20 must be present for **each** individual photodetector 12. This can also be seen from page 8, lines 18-20: "This signal processing circuitry 20, which is **replicated for each photodetector** 12 in the 2-D array..." In Claim 1, the electrical output signal from each photodetector is further required to be received by each of the "**plurality** of modulators" to generate a **plurality** of different modulated output signals which are then integrated to produce a **plurality** of different integrator output signals from each photodetector. This provides simultaneity of signal processing and also allows an image to be formed from a single pulse of light which can have a time duration of a few nanoseconds to a few tens of nanoseconds (see page 8, lines 1-3, and Claim 3).

In Fig. 4, Bamji discloses only a **single** modulator (mixer 310 in Fig. 4), and a **single** integrator (integrator 330 in Figs. 4 and 9) for **each** photodetector. Thus, inside each circuit 250 associated with **each** photodetector 240 in Bamji there is only **one** modulator and **one** integrator. Also, only a **single** output signal is produced for each photodetector 240 in Bamji in contrast to the requirement of Claim 1 for multiple output signals from the multiple modulators and multiple integrators associated with for **each** photodetector. That Bamji uses only a **single** mixer and a **single** integrator for each photodetector can also be seen from col. 4, lines 51-55: "**each** pixel detector in the detector array had its own dedicated electronics that included a low noise amplifier to amplify the signal detected by the associated pixel detector, a variable phase delay unit, a **mixer**, a lowpass filter, and **an integrator**." Thus, there is no 1:1 correspondence between the **single** modulator and **single** integrator for **each** photodetector in Bamji and Claim 1 which requires "a **plurality** of modulators associated with **each** photodetector" and "a **plurality** of integrators associated with **each** photodetector." Since the 1:1 correspondence required for a valid *prima facie* case of anticipation does not exist in Bamji, then Claim 1 is allowable.

In Bamji, data must be acquired sequentially for different phases using either a variable phase delay unit in which the phase delay is varied over time, or by selecting among different fixed modulation phases at different times. Applicants respectfully submit that using a **single** phase delay unit for each photodetector as disclosed by Bamji in which the phase is varied over time is not at all the same as Applicant's Claim 1 which requires "a **plurality** of modulators" each providing "a different phase delay" in order to simultaneously process the electrical output from each photodetector. The sequential operation in Bamji increases the time required to detect an image so that the device of Bamji requires periodic modulation, or a pulsed-type periodic waveform (see col. 4, lines 4-7; col. 7, line 60 through col. 8, line 18; col. 12, lines 27-29; and Figs. 2A-2E). The device of Bamji cannot form an image from a single pulse of light as is possible with Applicants' invention (see Claim 3). Therefore, Applicants respectfully request reconsideration of the 102 rejection of Claim 1.

Since Claim 1 is unanticipated by Bamji for the reasons set forth above, then dependent Claims 2-6, 8, 11 and 14, which stem from allowable Claim 1 and add further limitations thereto, are also allowable.

With regard to Claim 3, the Office on page 4 of paper no. 20070502 cites item 220 in Fig. 3 as disclosing a single pulse of light from the light source. Applicants respectfully traverse this since Fig. 3 clearly indicates that the light from light source 220 is sinusoidally modulated by adding the label "$S_1 = \cos(\omega t)$." This indicates that the light from the source 220 is periodically sinusoidally modulated with a constant amplitude rather than being pulsed. Therefore, the Office has not made a valid *prima facie* case of anticipation for the rejection of Claim 3 since it has not shown where in Bamji "a single pulse of light from the light source" is used to generate a 3-D image.

Claim 3 requires a 3-D image of a scene to be generated "in response to a single pulse of light from the light source." This is not possible with the device of Bamji and is not disclosed by Bamji. As discussed above, Bamji requires periodic modulation, or a pulsed-type periodic waveform which is not the same as a "single pulse of light" required by Claim 3. Therefore, Applicants respectfully submit that Claim 3 is not enabled by Bamji, and the public is not put in possession of the invention of Claim 3. There is no 1:1 correspondence between the "single pulse of light" in Claim 3 and Bamji so that Claim 3 is unanticipated by Bamji, and therefore allowable.

With regard to Claim 5, the Office cites item 210 in Fig. 3 as disclosing "the 2-D array of photodetectors is located on a first substrate, and the plurality of modulators is located on a second substrate." As substantiation for this, the Office states on page 4 of paper no. 20070502: "Given the broadest reasonable interpretation it reads on item 210, in Fig. 3." Applicants respectfully traverse both of these statements by the Office. First of all, the photodetectors 240 and associated processing circuits 250 which include modulators 310 (see Fig. 4) are both shown as being in array 230. Thus, from the depiction of array 230 in Fig. 4, one skilled in the art would understand that the photodetectors 240 and circuits 250 containing modulators 310 are located on a single substrate. Secondly, there is nothing that Applicants can see in Fig. 3 and the discussion thereabout that indicates that the photodetectors 240 and circuits 250 containing modulators 310 are located on two different substrates as required by Claim 5. Bamji provides ample evidence to indicate that the photodetectors 240 and circuits 250 including modulators 310 are formed on a **single** substrate. This can be seen from the Abstract ("The system includes on-chip photo-detectors, associated electronics, and processing."). This can also be seen from the Field of the Invention in col. 1, lines 20-24: "This invention relates generally to range finder type image sensors, especially range finder image sensors that are implementable **on a single integrated circuit** using CMOS fabrication..." Additionally, this can be seen from col. 9, lines 12-16: "The processing and use of phase shift information in the present invention will now be described with reference to FIG. 3, a block diagram depicting the present invention 200, a three-dimensional imaging system that preferably is **fabricated on a single IC 210**." Furthermore, col. 10, lines 5-15 states: "CMOS-compatible IC 210 will preferably have fabricated thereon oscillator 225 driver, array 230 (comprising perhaps 100x100 (or more) pixel **detectors 240** and 100x100 (or more) associated **processing circuits** 250)..." Applicants respectfully submit that from each of these statements above, one skilled in the art would understand that the detectors 240 and circuits 250 which include modulators 310 are fabricated on a **single** substrate. Therefore, Applicants urge that it is unreasonable on the part of the Office to interpret item 210 in Fig. 3 as disclosing "the 2-D array of photodetectors is located on a first substrate, and the plurality of modulators is located on a second substrate" when the weight of evidence is against this interpretation, and there is no substantiation in Bamji for the Office's interpretation. Therefore, Applicants respectfully submit that the Office has not made a valid *prima facie* case of anticipation for the rejection of Claim 5.

Applicants further respectfully submit that there is nothing in Bamji that discloses photodetectors and modulators located on two different substrates as required by Claim 5, so that Claim 5 is not enabled by Bamji, and the public is not in possession of the invention of Claim 5 based on Bamji. Therefore, Claim 5 is not anticipated by Bamji, and is allowable.

With regard to Claim 6, this claim is allowable since it stems from allowable Claim 5 and adds further limitations thereto. Furthermore, Claim 6 requires the first and second substrates to be "superposed one above the other and electrically connected together." Applicants respectfully submit that there is nothing in Fig. 3 which the Office cites for the 102 rejection of Claim 6 to show that the array 230 includes two substrates which are "superposed one above the other" as required by Claim 6. Figure 3 shows the array 230 as being a single unit which would be understood by one skilled in the art to be formed on a **single** substrate for the reasons set forth in the response to the 102 rejection of Claim 5 above. Furthermore, Fig. 3 shows the photodetectors 240 and circuits 250 containing modulators 310 to be located side-by-side and not "superposed one above the other" as required by Claim 6. Therefore, Applicants respectfully submit that the 102 rejection set forth by the Office is unreasonable, and that the Office has not made a valid *prima facie* case of anticipation for the rejection of Claim 6. Additionally, Claim 6 is not enabled by Bamji, and that the public is not put in possession of the invention of Claim 6 by Bamji. Therefore, Claim 6 is allowable.

With regard to Claim 14, this claim requires that "the **plurality** of integrators associated with **each** photodetector in the 2-D array comprises **three** integrators." Thus, from this claim, there must be "three integrators" which are "associated with **each** photodetector." The Office cites Figs. 4 and 9 in Bamji as reading on Claim 14. Applicants respectfully submit that this is not the case since Figs. 4 and 9 in Bamji show only a **single** integrator 330 associated with **each** detector 240. Therefore, Applicants respectfully submit that the Office has not made a valid *prima facie* case of anticipation for the rejection of Claim 14 so that this claim is allowable.

With regard to Claim 16, this claim recites the following two essential steps which are not disclosed by Bamji:

(b) simultaneously modulating the electrical output signal from each photodetector by a plurality of modulators operating at the same reference frequency, but with a different phase delay for each modulator, and thereby generating a plurality of modulated output signals for each photodetector; and

(c) separately integrating each of the plurality of modulated output signals for **each** photodetector and producing therefrom a plurality of integrator output signals wherefrom intensity and range information for each photodetector can be determined.

Step (b) above requires utilizing "a **plurality** of modulators" associated with each photodetector for simultaneously modulating the electrical output signal from that individual photodetector to generate "a **plurality** of modulated output signals for **each** photodetector." This step is not found in Bamji since Bamji discloses only using a **single** modulator 310 associated with each photodetector 240 as shown in Fig. 4, and as previously discussed in the response to the 102 rejection of Claim 1. Furthermore, Bamji discloses only generating a **single** output signal for each photodetector 240 as shown in Fig. 4, and as previously discussed in the response to the 102 rejection of Claim 1; whereas step (b) requires that "a **plurality** of modulated output signals" be generated "for **each** photodetector." Therefore, since Bamji lacks any disclosure of "simultaneously modulating the electrical output signal from **each** photodetector by a **plurality** of modulators" and "generating a **plurality** of modulated output signals for **each** photodetector" as required by step (b) in Claim 16, then the Office has not made a valid *prima facie* case of anticipation for the rejection of Claim 16.

Step (c) in Claim 16 is also not disclosed by Bamji. Step (c) requires utilizing a "**plurality** of modulated output signals" which must be separately integrated "for **each** photodetector" to produce "a **plurality** of integrator output signals." Bamji only discloses using a **single** modulated output signal for each photodetector 240 and a **single** integrator 330 for producing only a **single** integrator output signal for each photodetector 240. This can be seen in Fig. 4 of Bamji, and has been previously described in the response to the 102 rejection of Claim 1.

In view of this discussion, Applicants respectfully submit that the Office has not made a valid *prima facie* case of anticipation for the rejection of Claim 16 so that this claim is allowable. Furthermore, the disclosure in Bamji for a **single** modulator and a **single** integrator producing only a **single** integrator output signal does not enable the invention of Claim 16 or put the invention of Claim 16 in the possession of the public. Therefore, Claim 16 is unanticipated by Bamji, and is allowable.

With regard to Claims 17-21, these claims add further limitations to independent Claim 16 which is allowable for the reasons set forth above. Therefore, Claims 17-21 are allowable.

With regard to Claim 18, this claim requires a step for "detecting the reflected or scattered light from a single pulse of light from the light source." Applicants respectfully submit that this step of Claim 18 is not disclosed by Bamji and is not enabled by Bamji so that the public is not in possession of the invention of Claim 18. Bamji discloses a requirement for "a source of optical energy that emits a **modulated periodic waveform**" in each claim (see also Abstract, col. 4, lines 4-7). Figure 3 of Bamji further indicates that the light from light source 220 is sinusoidally modulated by adding the label "$S_1 = \cos(\omega t)$." This indicates that the light from the source 220 in Fig. 3 of Bamji is periodically sinusoidally modulated with a constant amplitude rather than being "a single pulse of light" as required by Claim 18. Therefore, Applicants respectfully submit that the Office has not made a valid *prima facie* case of anticipation for the rejection of Claim 18 since it has not shown where in Bamji there is a step for "detecting the reflected or scattered light from a single pulse of light from the light source." Thus, Claim 18 is allowable.

3. 103 Rejections:

A. The Office has rejected Claims 7 and 9 under 35 U.S.C. 103(a) as being obvious in view of Bamji and Dausch (7,026,602).

Since Claims 5 and 6 are allowable over Bamji for the reasons set forth above in response to the 102 rejection of these claims, then Claim 7, which stems from Claims 5 and 6 and adds further limitations thereto, is also allowable.

Additionally, with regard to Claim 7, the Office recognizes Bamji as disclosing that the photodetectors and modulators are located on a "partitioned substrate of IC 210" in paragraph 6 at the bottom of page 5 of paper no. 20070502. A "partitioned substrate" is nevertheless a **single** substrate so that one skilled in the art will understand that based on the "standard commercial silicon technology" (col. 11, lines 37-47) used by Bamji to fabricate his device as a single IC, the different elements on the "partitioned substrate" will be interconnected by wiring (i.e. metal traces) on the **single** substrate rather than being connected by solder bump bonds as recited in Claim 7. Solder bump bonds are utilized for electrically connecting two different substrates which are superposed one above the other as recited in Claim 7 rather than for connecting different elements on a **single** "partitioned substrate." This can also be seen from Fig. 3 of Dausch, and from col. 13, lines 40-50 in Dausch. Therefore, since Bamji discloses only a **single** "partitioned substrate of IC 210" as recognized by the Office, one skilled in the art would not be motivated to utilize any solder bump bonds as recited in Claim 7 since none are needed. Instead, the person skilled in the art would utilize wiring formed on the **single** substrate to interconnect different elements that are located on the **single** substrate. Therefore, Applicants respectfully submit that the Office has not made a valid *prima facie* case of obviousness for the rejection of Claim 7 so that Claim 7 is allowable.

Bamji also teaches against the use of two different substrates as required by Claim 7 and as disclosed by Dausch. This can be seen from col. 11, lines 37-46: "The two-dimensional array 230 of pixel sensing detectors preferably is fabricated using standard commercial silicon technology. This advantageously permits fabricating **a single IC 210** that includes the various pixel detectors 240 and their associated circuits 250, as well as circuits 225, 260, 270, 280, and preferably the energy emitter 220 as well. Understandably, the ability to fabricate such circuits and components **on the same IC** with the array of pixel detectors can shorten processing and delay times, due to shorter signal paths." Applicants respectfully submit that the above passage from Bamji would motivate one skilled in the art to form the detector and modulator on a **single** substrate as disclosed by Bamji since this would provide advantages to "shorten processing and delay times, due to shorter signal paths."

Additionally, each claim in Bamji recites that modulation of the photodetector is performed by quantum efficiency (QE) modulation. This QE modulation is performed internal to each photodetector by "varying the reverse bias coupled between the anode and cathode regions of the photodiode (col. 15, lines 36-40; see also col. 21, lines 19-22), and not by a separate modulator. Bamji further states: "in the present invention, dedicated electronic mixers (such as were used in the earlier invention described herein in FIG. 4) are avoided, and instead quantum efficiency (QE) modulation techniques are used." (col. 14, lines 37-40). Bamji also states: "FIG. 9A and other QE modulation embodiments described herein advantageously avoid mixers [i.e. modulators] and their need for a sufficiently amplified signal to be input for mixing." (col. 24, lines 1-4). This teaching and preference for QE modulation in Bamji, which is also required by each claim of Bamji, is contrary to the use of "a plurality of modulators" as required by Claim 1 since the QE modulation must be performed within each photodetector so that each modulator and photodetector are a single integral unit. This does not allow multiple modulators to be provided for each photodetector as required by Claim 1. Also, the use of QE modulation in Bamji is contrary to locating the photodetectors and modulators on two different substrates as required by Claim 7, again since the QE modulation must be performed inside each photodetector. Therefore, Applicants respectfully submit that one skilled in the art would form a device according to Bamji on a **single** substrate since only this arrangement allows the use of QE modulation as required by each claim of Bamji. In view of this, Applicants respectfully submit that Claim 7 is unobvious over the combination of Bamji and Dausch set forth by the Office.

With regard to Claim 9 listed in the 103 rejection based on Bamji and Dausch in paragraph 6 on page 5 of paper no. 20070502, Applicants assume that this is a mistake since the Office at the top of page 6 of paper no. 20070502 directs its remarks to Claim 10 instead of to Claim 9. Furthermore, neither Bamji or Dausch disclose an "indium gallium arsenide (InGaAs) photodetector as recited in Claim 9; and the Office makes a separate rejection of Claim 9 based on Bamji and Kaneshiro in paragraph 7 on page 6 of paper no. 20070502. Therefore, Applicants will address their remarks to Claim 10 for the rejection of paragraph 6 on page 5 of paper no. 20070502 which is based on Bamji and Dausch.

With regard to Claim 10, the Office cites Dausch for disclosing a mercury cadmium telluride (HgCdTe) photodetector which is not disclosed by Bamji.

Claim 10 is allowable since it is based on Claim 1 which is unobvious over Bamji or Bamji and Dausch in requiring "a **plurality** of modulators associated with **each** photodetector" and "a **plurality** of integrators associated with **each** photodetector" neither of which are taught or suggested by Bamji. Bamji discloses only a **single** modulator and a **single** integrator for each photodetector as previously discussed in the response to the 102 rejection of Claim 1. It would not be obvious to use multiple modulators and multiple integrators in the device of Bamji since the device of Bamji is fully functional "as is" using only a single modulator and a single integrator for each photodetector. Additionally, Bamji teaches a preference for QE modulation of the photodetector which is recited in each claim of Bamji. QE modulation occurs within the photodetector as a result of a reverse bias signal applied to the photodetector. Thus, QE modulation does not allow multiple modulators to be associated with each photodetector as required by Claim 1. Therefore, Applicants respectfully submit that Claim 1 is unobvious over Bamji, and that Claim 10, which stems from allowable Claim 1 and adds further limitations thereto, is also allowable.

Furthermore, in the 103 rejection of Claim 10, the Office has provided no reason why one skilled in the art would be motivated to substitute the HgCdTe photodetectors of Dausch for the Si photodetectors of Bamji which are already fully functional "as is." Therefore, Applicant respectfully submits that the Office has not made a valid *prima facie* case of obviousness for the rejection of Claim 10 so that this claim is allowable.

Additionally, Applicants respectfully submit that there is ample motivation for one skilled in the art not to substitute the HgCdTe photodetectors of Dausch for the Si photodetectors of Bamji. This motivation can be found in Bamji's preference for "using circuitry that can be fabricated on a **single IC** using CMOS fabrication techniques" (col. 3, lines 15-19) and for the use of "standard commercial silicon technology" which "advantageously permits fabricating a **single IC** 210 that includes the various pixel detectors 240 and their associated circuits 250, as well as circuits 225, 260, 270, 280, and preferably the energy emitter 220 as well" (col. 11, lines 37-47). Bamji also states that: "[p]referably CMOS fabrication is used to implement the array of CMOS pixel diodes or photogate detector devices." (col. 11, lines 54-56). Applicants respectfully submit that the above citations from Bamji would motivate one skilled in the art to utilize "standard commercial silicon technology" rather than to deviate from this technology and substitute HgCdTe photodetectors in place of Si photodetectors. The use of a HgCdTe photodetector as disclosed by Dausch will not allow the use of CMOS fabrication techniques to form the device of Bamji as a **single IC**, and will not allow the various circuits 250, 225, 260, 270, 280 to all be fabricated on the same substrate containing the photodetectors as a **single IC**. Therefore, Applicant respectfully submits that one skilled in the art would not be motivated to substitute the HgCdTe photodetectors of Dausch into the device of Bamji as suggested by the Office since this would defeat the expressed purpose of Bamji to use CMOS technology based on "standard commercial silicon technology" to form his device as a **single IC** and would further defeat the expressed purpose of Bamji in locating the associated processing circuitry on the same substrate as the photodetectors as a **single IC**. Therefore, Applicants respectfully submit that Claim 10 is unobvious over the combination of Bamji and Dausch , and is allowable.

B. The Office has rejected Claim 9 under 35 U.S.C. 103(a) as being obvious in view of Bamji and Kaneshiro (5,513,021).

Independent Claim 1 is unanticipated by Bamji for the reasons set forth in the response to the 102 rejection. Furthermore, Claim 1 is unobvious over Bamji for the reasons set forth in Section A above. Therefore, since independent Claim 1 is allowable, then dependent Claim 9, which stems from Claim 1 and adds further limitations thereto, is also allowable.

Additionally, Applicants respectfully traverse the statement by the Office in paragraph 7 on page 6 of paper no. 20070502 that Bamji discloses "a generic photodetector." The photodetector in Bamji is not "generic" as suggested by the Office, but instead is formed of silicon (Si) for the express purpose of being compatible with "standard commercial silicon technology" (i.e. CMOS technology) so that the Si photodetector can be fabricated on the same substrate as other processing circuitry as a single IC. This is described in detail in Section A above. Thus, one skilled in the art would not be motivated to deviate from the Si photodetector of Bamji since this would defeat the stated purpose in Bamji of being able to use "standard commercial silicon technology" which "advantageously permits fabricating a **single IC** 210 that includes the various pixel detectors 240 and their associated circuits 250, as well as circuits 225, 260, 270, 280, and preferably the energy emitter 220 as well" (col. 11, lines 37-47). The advantage of fabricating the device of Bamji on a single IC would be lost if one skilled in the art were to substitute another type of detector for the Si detector of Bamji. Therefore, one skilled in the art would not be motivated to utilize an "indium gallium arsenide (InGaAs) photodetector" as recited in Claim 9 in the device of Bamji since there would be no clear advantage in doing so, and because the advantages of forming the device as a **single IC** and using "standard commercial silicon technology" would be lost. Therefore, Applicants respectfully submit that Claim 9 is unobvious, and allowable.

Kaneshiro also states a preference for Si photodetectors (see col. 6, lines 39-42: "It is also preferred that the optoelectronic receivers employ **silicon photodetectors**, each having a receiving surface for receiving a respective modulated beam of light."). Therefore, one skilled in the art would be motivated based on both Bamji and Kaneshiro to utilize Si photodetectors in any device formed by combining Bamji and Kaneshiro since both of these references teach a preference for Si photodetectors.

The Office cites as motivation to incorporate the InGaAs photodetectors of Kaneshiro into the device of Bamji "to do so would at least improve the sensitivity of the photodetector" (see paragraph 7 on page 6 of paper no. 20070502). Applicants respectfully traverse this statement by the Office as being unfounded since there is nothing in either Bamji or Kaneshiro that teaches or suggests that an InGaAs photodiode is more sensitive than a Si photodiode. It is incumbent on the part of the Office to provide facts for the record. Therefore, Applicants request that the Office either take Official Notice that an InGaAs photodiode is more sensitive than a Si photodiode, or else point out for the record where this teaching or suggestion is found in Bamji or Kaneshiro. In the absence of any Official Notice or any explicit reference in Bamji or Kaneshiro that InGaAs photodetectors "would at least improve the sensitivity of the photodetector" as compared to Si photodetectors, Applicants respectfully submit that the Office has not provided the requisite motivation for a valid *prima facie* case of obviousness so that Claim 9 is allowable.

In view of the advantages of using silicon photodetectors detailed above in Bamji, and the preference for silicon photodetectors in both Bamji and Kaneshiro, Applicants respectfully submit that no clear advantage would be gained by substituting InGaAs photodetectors for the Si photodetectors in Bamji. Such a substitution would be disadvantageous since the ability to fabricate both the photodetectors and other circuits on the same substrate as a single IC using "standard commercial silicon technology" would be lost if InGaAs photodetectors were to be substituted for the Si photodetectors of Bamji. Therefore, Applicants respectfully submit that one skilled in the art would be motivated to use silicon photodetectors rather than to substitute InGaAs photodetectors for the silicon photodetectors in Bamji.

C. The Office has rejected Claims 23-25 under 35 U.S.C. 103(a) as being obvious in view of Bamji and Kakiuchi (6,822,687).

Independent Claim 23 includes the essential claim limitation (b) "**at least two** modulators receiving the photodetector output signal from **each** photodetector..." This essential claim limitation is not disclosed, taught or suggested by Bamji who discloses only a **single** modulator receiving the photodetector output signal from **each** photodetector. This can be seen from Fig. 4 which shows only a **single** modulator 310 connected to **each** photodetector 240. Additionally, each claim in Bamji requires QE modulation as has been previously discussed; and this must be performed inside each photodetector 240 which would preclude the use of "at least two modulators" for each photodetector as recited in Claim 23. Therefore, Claim 23 is unobivous over the combination of Bamji and Kaiuchi.

Additionally, the Office has not shown where in Bamji there is any teaching, suggestion or disclosure for the essential claim limitation (b) "**at least two** modulators receiving the photodetector output signal from **each** photodetector…" as required by independent Claim 23. Therefore, Applicants respectfully submit that the Office has not made a valid *prima facie* case of obviousness for the rejection of Claims 23-25 so that these claims are allowable.

Independent Claim 23 also discloses a requirement that the 3-D camera generate "a 3-D image of a scene **illuminated by a single pulse of light** from a source." This is not possible with the device of Bamji since Bamji only teaches the use of "a modulated periodic waveform whose high frequency component may be idealized as $S_1 = \cos(\omega \cdot t)$" (see Abstract) with a preferred duty cycle close to 100% (col. 9, lines 28-33). Although Bamji discloses that a "pulsed-type periodic waveforms may be used" (col. 7, lines 60-61), this is not "a single pulse of light" as required by Claim 23 as can be seen from Fig. 2D, but instead includes multiple pulses. Furthermore, a "pulsed-type periodic waveform" is not preferred by Bamji since this requires a much larger peak power from the optical energy emitter (col. 9, lines 2-10). Kakiuchi also discloses a 3-D camera which requires "pulse modulated laser beams" from multiple light sources as recited in the Abstract and claim 1, and as shown in Figs. 7, 9, 12 and 15-18. Therefore, since the requirement of Claim 23 for a 3-D camera which is capable of generating "a 3-D image of a scene **illuminated by a single pulse of light** from a source" is not taught, suggested, or disclosed by Bamji or Kakiuchi, then Claims 23 – 25 are unobvious over this combination set forth by the Office.

4. Objection to the Claims:

The Office has objected to Claims 13, 15 and 26 as being dependent upon a rejected base claim, but has indicated that these claims would be allowable if rewritten in independent form including all of the limitation s of the base claim and any intervening claims.

In view of the allowability of independent Claims 1 and 23 for the reasons set forth above, Applicants respectfully submit that there is no need to rewrite Claims 13, 15 and 26 in independent form.

Conclusion

Applicants have responded to each and every rejection and objection, and urge that the Application is in condition for allowance. A favorable reconsideration and entry of the amendments presented herein is earnestly solicited.

Respectfully submitted,

Dated: June 27, 2007

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CERTIFICATE OF FACSIMILE

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being sent by Facsimile on the date shown below to the PTO by FAX at 571-273-8300.

MARY LOUKOTA
(Type or print name of person faxing paper)

Mary Loukota
(Signature of person faxing paper)

Dated: 6-27-07